(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
7 September 2001 (07.09.2001)

PCT

(10) International Publication Number
WO 01/64042 A1

(51) International Patent Classification[7]: A23C 19/09

(21) International Application Number: PCT/SK01/00003

(22) International Filing Date: 23 February 2001 (23.02.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PV 0278-2000 28 February 2000 (28.02.2000) SK

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(81) Designated States *(national)*: HR, HU, PL, RU, UA, YU.

(84) Designated States *(regional)*: European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/64042 A1

(54) Title: CHEESE- AND MILK PROTEIN-BASED FOOD PRODUCT AND THE METHOD OF ITS PREPARATION

(57) Abstract: The invention relates to no coated mixed cheese- and milk protein-based food product, which is industrially prepared as a frozen or a chilled product, and which is heat-treated for consumption. The food product according to the invention comprises a shaped basic mixture constituted of 50 to 90 wt.% of natural cheese, 5 to 40 wt.% of low-heated (LHR) or high-heated (HHR) rennet curd and 5 to 30 wt.% of binder, on the basic mixture's weight. The method of preparation of food product according to the invention consists of grinding of natural cheese for the purpose of creation of cheese bases for mixtures product, adding of LHR and /or HHR, binder to the cheese base of product for the purpose of creation of the basic mixture, and respectively adding or without adding of flavourings and aromatic additives, followed agitation of basic mixture for the purpose of its homogenisation, dosing and forming of basic mixture in the determined final shape, consumer packing. At the end, the product is cooled at the temperature about 5 °C or frozen to the temperature about or bellow -180 °C. Before consumption the product is heat-treated, e. g. by frying, grilling, baking or deep-frying.

CHEESE- AND MILK PROTEIN- BASED FOOD PRODUCT AND THE METHOD OF ITS PREPARATION

Technical field

The invention relates to no coated mixed cheese-and milk protein-based food product and the method of its industrial preparation as a frozen or a chilled convenience food, which is heat treated by baking, frying, or deep-frying before consumption.

The present state of technique

The utilisation of the coated industrially prepared food, which are frozen or chilled during the production and for consumption are heat treated by baking, frying, grilling or heating are known from food processing of fish and fish products, poultry, pork and beef, vegetables, fruit, cereal and nuts and their combination.

The most extent known products of them are fish fingers or fish nuggets (In: INFOFISH-International, No. 4, pp. 17-20, 1989). In the production of the mixed formed products from raw vegetable material, the frozen components (vegetables with the addition of meat, poultry) are first formed into blocks under high pressure after which are cut to the resulting shape – pieces, fingers, small balls, blocks, squares, etc. and these are then coated and frozen (In: Food Review, 13 (1) 19, 1986). Thus coated components are short-time fried to strengthen the coating or coatings (a temperature approx. from 150°C to 250 °C, for 15 to 60 seconds), they are then cooling or freezing (a temperature from -18°C to –40 °C). It is necessary this product to fry or to bake by the conventional method or to heat in microwave oven before consumption. In this case multiple-component coating mixtures: cohesive dough, adhesive dough, predust and breading crumbs (see WO 95/23523) are used. It is used minimal two-

component coating material comprises coating dough and breadcrumbs, e.g. for the fish fingers.

These cheese-based food products are very rare at present. The reason for that lies in the characteristics of the available types of cheese which degrade already at temperatures under -18 ° C and loose their characteristic taste and structure after defrosting (disintegration of texture, instability, or water and fat migration, etc.). Another reason for it is that the majority of cheese start melting and leaking through the coating to the frying oil after a short time (few tens of seconds) during the final heat treatment of this frozen or chilled food product before consumption, the first of all, during frying in oil (at a temperature about 174 ° to 340°C).

It is known a cheese sandwich (US P 4 000 324), in which a slice of cheese has been used, in the form of e.g. an open-face bun or a hamburger bun. The sandwich prepared on this method is coated with breadcrumbs, with the coating dough and finally is coated with breadcrumbs again. The resulting product is pre-heated in fat and then frozen. The product is prepared for the consumption again by heating in oil (350°C for 2,5 minutes). Although the battering of a cheese slice into a bread component and multiple-layer (3-components) coating prevent of leakage of the cheese into the frying oil, but it does not prevent segregation of moisture during freezing (from the cheese to the bread component, and backwards during defrosting), the change of texture and a loss of characteristic cheese-taste. The slice of cheese represents, in this type of coated frozen product, only the minor part of the cheese base (max. to 25 wt.% of the product's weight) and the basic bread component and the multiple-layer coating material on the basis of bread crumb and additives represent the main part of the product.

Also, it is known coated cheese product on the basis of cheese Halloumi (WO 96/15680). It concerns a frozen product of the finger type on the basis of cheese Halloumi, which is grated and reconstituted, the cheese particles are mixed with a binder (egg white or starch), the mixture is then formed into resulting shape of fingers, which are coated with an adhesive coating dough, and finally is applied breadcrumb. It is then chilled and frozen. The known cheese

Halloumi, which is made mainly from goat milk, has an unusual property, resulting from the way in which it is made. This cheese retains its physical integrity during heat treating, so that it retains its shape (instead of softening like other cheeses), without melting into a low-viscosity material. It is resistant to the temperatures during baking, grilling, frying and heating in microwave oven. This product thanks to special properties of Halloumi cheese and a particular composition of coating multiple-component material can be heat treated for consumption without leakage. But cheese Halloumi has a nondescript flavour and therefore is necessary the addition of the flavouring additives to the basic mixture.

Lately was described in the patent literature a method of preparing food product on the basis of cheese (EP 168 118). This product consists of one or more slices of cheese with or without ham in between them. This base of product is coated with an edible coating material and resulting product is frozen at a temperature bellow –30 °C and heat treated at a temperature about 200 °C prior to consumption, e.g. by frying. It is necessary to use cheese, which is technologically suitable for slicing or frying. Also, it is necessary to use rapid freezing bellow -30 °C and careful short-term frying, because the cheese gets soft and it is necessary to prevent leakage of the cheese by using a suitable coating material.

In another solution (WO 98/0953) is described the piquant cheese stuffing for food, which can be frozen and it is meltable during repeated heat treating without fat separation and stuffing maintains organoleptic properties of cheese. This stuffing consists of max.40 to 85-wt.% weight of cheese, 10 to 25 wt.% of oil and fat, 2 to 20 wt.% of moisture stabiliser and 1 to 5 wt.% of emulsifier. These additives to cheese provide stability of oil/water emulsion and they also as follows modified the viscosity of stuffing to the required value. This stuffing must be heat treated before its giving into the resulting food product. This stuffing is beneficially pasteurised before its extrusion into the food product, which created simultaneously the firm outside coating.

It is known also a coated product with cheese stuffing from the bread dough (WO 99/2039). This baked food product contains cheese stuffing completely

coated with a layer from leavened dough. The cheese stuffing consists of 94 to 99 wt.% processed cheese, 0,2 to 2 wt.% hydrocolloidal gum soluble in water and 0,5 to 4 wt.% of starch. The production of this product requires application of processed cheeses not much melted. Dough coating forms 30 to 70 wt.% of the product. Similar is also composition of baking cheese product (WO 99/29180), which in compare to above mentioned coated products substitutes usage of liquid egg coating in dry process of production, because this liquid coating has a negative influence on durability of products. This baked cheese product contains a cheese core and one or more coating layers, which consist of breadcrumbs or dough. Coating layer is joined to the cheese layer by heating its surface. By this way the cheese get soft and then on so softened surface of cheese core is applied a breadcrumbs layer without application of binder. The resulting product is fried, baked or deep-fried. The firm connection of a breadcrumbs layer or dough protects product against cheese leakage during final heat treatment.

It is generally known that cheese or processed cheese has become after freezing and then after defrosting less palatable. The freeze treatment causes both segregation (loose moisture) and destabilisation in the cheese (texture). When heating the cheese-based product for consumption, e.g. by frying in oil, the physical instability of the cheese is exhibited with its softening and its tendency to leak through the coating to the frying oil. This depreciates the food product, the basic cheese component of which gets lost (leaks out), the coating of which remains half-empty and the basic matter of which contains bubbles. The consequence of this is a tasteless, half-empty, and deformed food product. The result of the above is the limited, but rather exceptional, use of cheese as a basis for coated frozen products. In the case, when the cheese stuffing are used, it is necessary to coat they with dough, breadcrumbs etc. and also to stabilise cheese base against water and fat migration, and therefore must be applied various additives. The application of mixed no-coated in breadcrumbs or in dough products, which would be contain high content to 90 wt.% of natural cheese on the weight of resulting product and would be prepare without fat and stabilisers, are not known in industrial production.

The principle of the invention

The mentioned shortcomings of coated food products on the cheese basis and with cheese stuffing have been significantly removed in a frozen or chilled no coated food product on the basis of cheese and milk protein which is uses as a shaped basic mixture constituting of 50 to 90 wt.% of natural cheese or cheese mixture, 5 to 40 wt.% of milk proteins, advantageously high- and/or low –heated rennet curd and 5 to 30 wt.% of binder, on the total weight of the basic mixture.

To the basic mixture can be added, but it is not necessary, flavouring and aromatic additives, which include meat, vegetables or their combinations, wherein the content of these additives should be between 5 to 40 wt.% of the total product 's weight.

The method of preparation of food product according to the invention is characterised by the following operations: At first, grating or grounding of natural cheese produces a cheese base of product. Then the others components of basic mixture are added, namely milk proteins and binder in the amount according to the invention. These components are mixed together until a homogenous basic mixture has been created. During mixing it can be added flavouring and aromatic additives to the basic mixture. At the end the homogenised basic mixture is formed in dosing and forming machine to a determined shape, wrapped in a consumer packing and as follows the product is chilled to 5°C or frozen at a temperature above or bellow –18 °C according to a requirement for durability of final product.

The final preparation of product before consumption is frying, deep-frying, grilling or baking. It is not needed to coat of basic mixture. The heat treatment resulted in a natural strengthening of basic mixture surface and at the same time the naturally soft consistency of frying product is retained.

The term "***low-heated rennet curd***" (further only **LHR**) ***or "high –heated rennet curd"*** (further only **HHR**) is used in the patent application for identifying proteins which are obtained through careful or high coagulation from milk, whey or other dairy by-products (e.g. buttermilk), or from their combination. LHR and HHR can be characterised as follows: the dry matter approx. 20 to 50 wt.%,

acidity approx. 20 to 40 °SH with the content of casein proteins 70 to 80 wt.% and 20 to 30 wt.% of whey proteins in their combination.

The binder according to the patent application means a mixture of 5 to 50 wt.% breadcrumbs, 5 to 30 wt.% stabiliser and 40 to 85 wt.% modified starch

Examples of embodiment of the invention

The basis of the invention is explained in the following examples of the food product's preparation. The mentioned examples provided are only illustrative and do not exhaust all possible alternatives of the food product's composition according to the present invention.

Example 1

The food product consists of basic mixture which is generated from 70 wt.% of grated Edam cheese (e.g. *Eidamska tehla*-type), 20 wt.% of LHR or HHR into which 10 wt.% of binder is added. The basic mixture is formed into shape of fingers or rolls, or balls.

Example 2

The basic mixture of this food product comprises 70 wt.% of natural cheese *Moravsky bochnik*-type, 10 wt.% LHR and 10 wt.% of another meat-type component, in our case it is sausage product and 10 wt.% of binder.

Example 3

The food product comprises the basic mixture containing 70 wt.% of cheese *Eidamska tehla* (Edam brick cheese)-type, 10 wt.% of LHR, 8 wt.% of meat additive and 12 wt.% of binder.

Example 4

The food product comprises the basic mixture of 60 wt.% low-heated cheese of Edam-type, 20 wt.% of milk proteins, a combination of LHR and HHR, and

20 wt.% of mixture's weight of flavouring vegetable additives, aroma and binders. The forming of basic mixture is the same as in Example 1.

Example 5

The food product comprises the basic mixture of 60 wt.% high-heated cheese (e.g. *Emental*-type or *Moravsky bochnik*-type), 20 wt.% of LHR and 20 wt.% of basic mixture weight represents flavouring additives of smoked meat and binder.

Example 6

The food product comprises the basic mixture which is prepared of a combination of two different cheese-type with a part of 70 to 90 wt.%, 5 wt.% to 15 wt.% of binder additive and a 5 to 30 wt.% of combination of milk proteins, wherein the minimum dry matter content is 50 wt.%. The basic mixture can be flavoured with meat in amount of 10 to 20 wt.% or vegetable in amount of 10 to 15 wt.% on the weight of basic mixture. The shape of resulted product can be in form of "fingers" from 90 to 120 mm in length and thickness approximately from 14 to 22 mm. Croquettes can be also made with diameter of 16 to 30 mm. The product can be prepared in the shape and size of children's sponge cakes etc.

Example 7

The method of preparation the food product according to the invention is simple and consists in the following steps. First of all, there is the raw material preparation, in which it is prepared a cheese basis of product by grounding of natural cheese to the particle size approximately of 4 to 5 mm, simultaneously a milk protein e.g. the *low heated rennet curd* (LHR) is warmed to the temperature of 70 °C for 20 minutes and also the raw materials for binder preparing including salt, egg white, frimulsion, starch are prepared according to the formula. As follows, all components of basic mixture are mixed together in determined parts according to the invention and the result is the creation of homogenous basic mixture.

During the mixing it can be, but it is not necessary, added flavourings and aromatic additives into the basic mixture. At the end, the homogenised basic mixture is formed in dosing and forming machines for example in machine REON in arbitrary shape, in our example in shape of croquettes with diameter of 20 to 35 mm and weight of 10 g.

Then the final products are vacuum packed in transparent foils and placed into a consumer carton box 15 pieces of croquettes per box. Incidental, a consumer amount of shaped food product according to the invention, packed into PVC shapers for example 4 pieces per shapers, is prepared after freezing or cooling to expedition. The storage life depends on the type of final product treatment, 2 or more months for frozen product, 30 days for chilled product.

The product is cooled to the temperature of 5 °C or frozen to the temperature of -18 °C or of -30 °C according to the requirement for durability of final product. The final preparation for consumption is for example by classical frying or deep-frying in hot oil for approximately 2 minutes.

Before heat treatment it is not needed to coat the basic mixture to dough or to breadcrumbs. By the final heat treatment will be reach a natural hardening of basic mixture surface and simultaneously a natural soft inner consistency of fried product will be reserved without a cheese leakage into oil. Adding of fat or oil to the basic mixture is not needed for gaining of demanded consistency or for processing of this mixture.

Basically, these products, according to the technical solution, can be pre-fried (at the temperature of 180 °C, for approximately 30 sec.). Pre-frying is not needed for achieving shape cohesion of the product in view of the product composition. The product without pre-frying was subjectively as having better taste.

Prepared for consumption, the frozen or chilled food product, according to the invention, has taste and sensory characteristics of freshly fried cheese. In frozen condition, the product can be stored for a long time. It can be heat treated by conventional frying, baking or grilling for consumption with not danger of leakage of the cheese. The addition of LHR or HHR to the product increases its

biological value and gives it the character of a "lighter" (dietetic) product. The LHR and HHR represent low-heated and high-heated rennet curd, respectively. These milk proteins, which are obtained from dairy products (for example buttermilk, whey, milk, etc.), include whey or casein proteins or their combination. On this way can be obtained milk proteins (LHR, HHR) with content of dry matter 20 to 25 wt.%, with acidity 20 to 40 °SH. The part of whey proteins represents 20 to 30 wt.% and casein proteins 70 to 80 wt.%, in the case of a combination. The addition of whey protein, or a combination of casein and whey proteins, into the basic mixtures has positive effects on maintaining the physical characteristics of the basic mixture during heat treatment (e.g. deep-frying in oil), and addition of oil or other fats are not demanded.

The whey and casein proteins of the LHR and HHR have positive effects with regards to smoother taste and reduced acidity of the product. The final result of this is a pleasant milky taste of the product. The texture of the product is smooth. After cooling down, the product remains soft and tasty, having the typical taste of cheese or flavoured cheese. If heat treated by conventional method, e.g. frying in oil for consumption, neither the outer layer of the product or the product as a whole get soaked with oil and make a "greasy" impression. The basic mixture can be easily formed into any shape, such as e.g. fingers, rolls (tubes), squares, blocks or balls. The final product has very good shape stability even if subject to freezing, defrosting, or heat treatment after freezing or before consumption. This is true also for cooled products of this type with the compositions according to this invention.

Besides positive taste and dietetic characteristics, the product is very suitable for industrial processing, has long-term shape stability and long shelf life. Very favourable is the comparison between the production price and the consumer benefits, inclusive of technological properties from the point of view of production, also final treatment before consumption and dietetic properties as a food. Besides above - mentioned positive effects, also the organoleptic characteristics of natural cheese are remained in this product.

PATENT CLAIMS

1. Food product on the bases of cheese and milk proteins, **characterised in that** comprises the shaped basic mixture constituted of 50 to 90 wt.% natural cheese, 5 to 40 wt.% milk proteins and 5 to 30 wt.% binder on the total weight of basic mixture.

2. Food product according to Claim 1, **characterised in that** the cheese base of basic mixture is generated from one type of natural cheese or a combination of minimum two type of natural cheese.

3. Food product according to Claim 1, **characterised in that** the low-heated rennet curd (LHR) or the high-heated rennet curd (HHR) or their combination are used as milk proteins, whereby milk proteins are characterised by dry matter content approximately from 20 to 50 wt.%, acidity approximately from 20 to 40 °SH, a part of casein proteins is 70 to 80 wt.% and whey proteins 20 to 30 wt.% in a combination LHR with HHR.

4. Food product according to Claim 1, 2 and 3, **characterised in that** besides the basic mixture it can, but it need not contain flavourings and aromatic additives including meat, vegetables and spices or their combinations, wherein the part of these additives ranges from 5 to 40 wt.% on the product's total weight.

5. The method of preparation of food product according to Claim 1, one or more further foregoing Claims 2 to 4, **characterised in that** it consists of the following steps:

   - grating or grinding of natural cheese for the purpose of generation of cheese base for the basic mixture,

   - adding of LHR and/or HHR, binder to the cheese base of the product and respectively adding of flavourings and aromatic additives,

- agitation of the created basic mixture for the purpose of its homogenisation,
- dosing and forming of the basic mixture in the determined final state,
- cooling of the created mixture at the temperature about 5 °C or freezing about or bellow -18° C ,
- heat-treatment, e.g. by deep-frying, grilling or classical frying and baking before consumption.

INTERNATIONAL SEARCH REPORT

Inte. ional Application No
PCT/SK 01/00003

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23C19/09

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, FSTA, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	column 4, line 15-25 column 4, line 63-65 column 5, line 37-47 claim 1; examples 4-6; tables 3,4	5
X	FR 2 280 325 A (BEL LA VACHE QUI RIT FROMAGE) 27 February 1976 (1976-02-27)	1-4
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
6 July 2001	16/07/2001

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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